Protecting the nation

Russia's Central Tuberculosis Research Institute is using a Freedom EVO® workstation to help in the fight against tuberculosis. The platform provides fast and secure sample preparation, allowing molecular diagnosis of *M. tuberculosis* infection in just a few hours.

Founded in 1921, the Central Tuberculosis Research Institute of the Russian Academy of Medical Science (CTRI RAMS), Moscow, is a global leader in the development and application of advanced techniques for the effective control of tuberculosis (TB). The Institute consists of nine research divisions, including four 400-bed clinical departments, and the Institute's multidisciplinary research team studies every aspect of the diagnosis, pathology and transmission of TB.

Diagnosis of TB, and determination of antimicrobial sensitivity, generally takes 6 to 14 weeks using classical microbiological methods, delaying provision of appropriate treatment and contributing to the high TB-associated mortality rate in Russia. To reduce this lengthy detection time, the CTRI RAMS' Department of Microbiology – led by Professor Larisa Chernousova – is investigating new approaches to improve the diagnosis of tuberculosis, including a novel genetic technique based on PCR (polymerase chain reaction). Larisa explained: "A vital step in this highly sensitive method is the extraction of DNA from patients' sputum samples. This is a monotonous and labor-intensive process when performed manually, requiring high levels of concentration to avoid cross-contamination between samples and subsequent false positive results, and so is ideally suited to automation."

Working in collaboration with Syntol – a specialized clinical diagnostic company in Russia – the Institute has developed an automated protocol that allows safe and effective handling of potentially highly contagious *M. tuberculosis* samples without the need for costly biosafety measures. This technique uses an inactivation buffer to kill any mycobacterium present, offering safe handling of patient material without compromising the quality of the extracted DNA. The workflow was initially developed on a Freedom EVO 75 before being transferred to the Department's Freedom EVO 150 workstation. It includes dilution of the sputum samples and addition of the inactivation buffer using the instrument's Liquid Handling (LiHa) Arm, magnetic extraction of the *M. tuberculosis* DNA from clinical samples and microbial cultures, transfer of the extracted genetic material to PCR tubes, and online PCR amplification.

Professor Chernousova continued: "Extraction of 48 samples takes just 95 minutes, allowing us to process up to 144 samples a day if required. Once the extraction process is complete, the recovered DNA is transferred directly to PCR tubes and automatically loaded onto a thermocycler for amplification. This provides true walkaway processing and significantly increases the laboratory's throughput, while also lowering the cost per test."

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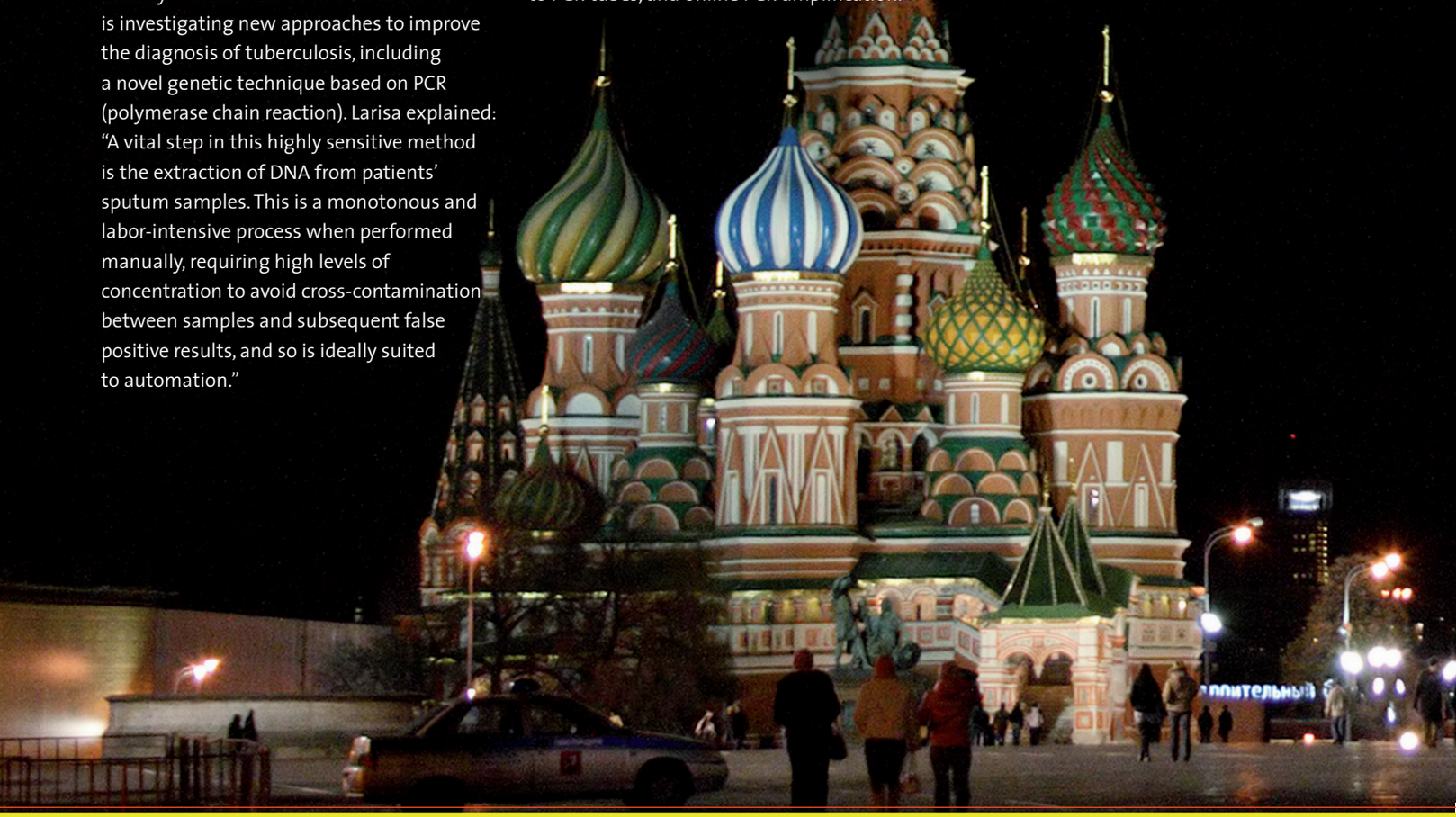

From left to right: Professor Larisa Chernousova, Tatiana Smirnova and Dmitry Varlamov from the CTRI RAMS' Department of Microbiology

Due to the high sensitivity of the PCR-based technique, minimizing the risk of errors and cross-contamination was crucial, and so the laboratory carried out rigorous testing and validation prior to bringing the Freedom EVO 150 platform into routine operation. "We were very happy with the performance of the system during our carry-over studies," Larisa added. "Even a microdrop of aerosol containing genetic material could cause contamination in this process, but none of our negative controls showed amplification by PCR. We have also been impressed by the flexibility and open architecture of the platform, and now plan to use additional Tecan workstations for complete automation of our bacteriology workflows in the future – from preparation of reagents and media to culture seeding and incubation."

In the first four months of operation, the laboratory has prepared over 500 clinical samples for analysis. The Freedom EVO workstation offers considerable time savings while reducing the labor required. "This helps the laboratory to identify the causative agent of a patient's symptoms much faster, providing clinical staff with the right information to effectively treat patients far earlier," Professor Chernousova concluded.

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